



Europäisches Patentamt
European Patent Office
Office européen des brevets



Publication number: 0 439 383 A1



EUROPEAN PATENT APPLICATION

Application number: 81360500.0

Int. Cl.²: D21H 15/62, D21H 13/46,
B41M 5/02

Date of filing: 25.05.81

Priority: 25.05.80 US 400687

Date of publication of application:
21.07.81 Bulletin 81/31

Designated Contracting States:
DE FR GB

Applicant: KODAK CORPORATION
Horseferry Square
Roulevard New York 10044 (US)

Inventor: Madhava, Sreed L.
4101 Yaffey Drive
Mississauga, Ontario (CA)
Inventor: Rutland, David F.
538 Beaver Court
Mississauga, Ontario (CA)
Inventor: Jones, Arthur Y.
4100 Yaffey Crescent
Mississauga, Ontario (CA)

Representative: Girdle, den Roy et al
Rue de la Loi 100, 1000
Bruxelles 1050 (BE)

Treated as prior art

A paper comprising a supporting substrate with a coating including a dyeing component and a hydrophilic polymer, and more specifically in an embodiment the paper comprises a supporting substrate treated with dyeing agents selected from the group consisting of (1) hydrophilic poly(alkylacrylates); (2) poly(alkylene glycol); (3) poly(arylene ether); (4) poly(alkylene ether) copolymers; (5) fatty ester modified copolymers of phosphate, acrylate, glycerol, poly(alkylene glycol), sulfonamide, acid, sulfonic acid and alkyl amine; (6) poly(alkylene ether) modified copolymers of acrylate, fatty amine, sulfonic amides, ester oil, fatty acids and fatty alcohols; (7) fatty acidolamides; and (8) fatty alcohols.

0 439 383 A1

TREATED PAGES

In a patentability search report the following United States patents were recited: US-A-4,472,922, which discloses a method for obtaining super absorbent gelling agent and a strong absorbent, such as the reaction product of a water soluble polyoxy-organopolyimide, including one derived from the reaction of sulfuric acid and diethylene triamine, an epichlorohydrin, such as epichlorohydrin, bis(hydroxyethyl)urethane, or polyethylene glycol; US-A-4,468,290 which discloses quaternary ammonium salts of epichlorohydrin polymers as fiber coating materials; US-A-4,468,291 disclosing water soluble polymers with a predominantly polyalkyleneoxy backbone containing ammonium salt groups; US-A-4,470,764 directed to a slurry compo-

Disclosed in the US-A-4,740,420 is a recording medium for ink jet printing comprising a support member containing at least in its surface portion thereof a water-soluble metal salt with the fun variance of the metal thereof being 2 to 4 and a carbonic compound.

total.

Further, there is disclosed in US-A-4,754,727 a paper with sizing agent which contains from 1 to 50 parts by weight of a sizing and sizing accelerating agent and from 0 to 50 parts by weight of conventional cellulose or 10 parts by weight of hydrocolloid, colloid-soluble sizing materials, the sizing and sizing accelerating agent being a polymer consisting of linear or branched carbon chains to which primary, secondary or tertiary amino and/or quaternary ammonium groups are bound directly or by side chains.

Additionally, there is disclosed in US-A-4,519,201 an aqueous size composition with a sizing agent comprising, for example, (1) 70 to 99.9 weight percent of a substituted alkyl succinic anhydride or a substituted alkyl succinic acid chloride or a mixture thereof, and (2) 0.1 to 30 weight percent of phosphates of polyoxyethylene alkyl ether resins or phosphates of polyoxyethylene alkyl aryl ether resins and a process of using this composition for the preparation of papers by dissolving the composition, adding the resulting aqueous dispersion to a pulp slurry or paper making material.

Moreover, there is disclosed in US-A-4,425,465 an ink jet recording sheet comprising a paper support applied on at least one surface thereof or internally a composition which comprises an aqueous dispersion of acrylate(s)/acrylonitrile, vinylpyrrolidone-vinyl acetate copolymer or a mixture thereof serving as a binder or sizing agent and a white filler. The white filler can be contained in a binder weight ratio of 10:1 to 0.2:1 upon the composition is applied on the surface of the paper support. When the composition is internally incorporated in the recording sheet, it can comprise 10 to 50 parts by weight of the filler and 2 to 30 parts by weight of the binder per 100 parts by weight of pulp.

Further, there is disclosed in US-A-4,334,761 an ink jet recording sheet with a recording surface which includes a combination of a water soluble polyvalent metal salt and a cationic polymer, said polymer having cationic groups which are available in the recording surface for immobilizing of an anionic dye.

The following U.S. patents are also mentioned: US-A-4,701,367 relating to coatings such as ethylenediamineborohydride trichloride for typosetting fabric transparencies, see the Abstract of the Disclosure for summary; US-A-4,711,518 relating to transparent stencil materials for plain paper electrostatic imaging apparatuses, which sheets contain an image receiving layer; US-A-4,723,376 relating to transparencies with a coating layer of a penile electrical resistance; and US-A-4,750,881 which discloses an ink receiving coating containing particles of alkali, aluminum silicate, zinc oxide, or titanium dioxide.

There are disclosed in US-A-4,752,746 and US-

A-4,222,225 methods for the preparation of electrographic recording papers for imaging. More specifically, according to the teachings of these patents electrographic recording papers can be prepared by applying a dielectric coating on a relatively conductive sheet. Various compounds, such as acids and other compounds capable of retaining or attracting moisture in the sheet may be incorporated into the paper to enhance the conductive properties. In some recording papers the dielectric layer is applied on one side of the paper and the dielectric is applied to the other side. Also, the dielectric layer can be applied over the conductive layer. Other conventional recording papers comprise an electrostatically conductive layer and a dielectric layer thereon on one surface of a base paper and an electrostatically conductive layer on the other surface of the base paper. Materials selected as the dielectric layer include highly insulating resins such as silicone resins, epoxy resins, poly(vinyl acetate) resins, vinyl acetate resins, vinyl chloride resins and styrene-butadiene copolymers. These resins are generally dissolved in an organic solvent and coated on the base paper. It is usually necessary to provide an undercoat layer as a primer coating on a base paper prior to the coating of a solution of or organic solvent to prevent penetration of the solvent used into the paper. Examples of other electrographic papers are prepared by applying a dielectric film of dielectric materials such as poly(ethylene) or poly(propylene) to the paper surface by melt extrusion. Also disclosed in US-A-3,011,315; 3,254,137; 3,345,070 and 3,110,821 are papers for electrostatic recording employing aqueous coatings both for the dielectric layer as well as the conductive layer. The materials of the conductive layer can be water soluble or dispersible vinyl benzyl quaternary ammonium compounds and the dielectric layer can be composed of carbonylated poly(vinyl acetate) in an aqueous emulsion solution.

Also disclosed in US-A-4,755,744 is an electrostatic recording paper, which paper can be prepared by applying three successive aqueous coats to a machine glazed side of a paper web. The first coating contains titanium dioxide and an electroconductive water dispersible polymer of a vinyl benzyl quaternary ammonium compound. The second coating can be composed of calcium stearate and calcium carbonate, and the third coating may contain calcium acetate and a carboxylated poly(vinyl acetate) in aqueous solution. The resulting wet coating can be dried between successive coatings and may be blown dried, see the Abstract of the Disclosure for example.

Additionally, there are disclosed in US-A-3,790,435 and US-A-4,315,860 synthetic papers and methods for the preparation thereof. The term synthetic paper as indicated on page 1, line 20, of US-A-4,315,860 refers to a paper like fibrous structure in the form of thin sheets or films of synthetic materials, which papers can be employed in wetting or

printing processes. Disclosed in US-A-2,385,868 are oriented thermoplastic film laminated structures which can be selected for various imaging processes. Polymers for structures having a matte finish and a certain texture achieved with the addition of fillers which roughen the surface upon abradability of the film and renders them receptive to marking by crayons, pencil and ballpoint pen are disclosed in US-A-3,184,464. Laminates comprising layers of oriented films of thermoplastic materials in which at least one of the substrate layers contains a suitable inert additive are disclosed in US-A-2,573,626. These laminates are useful in films which may be written on by a pencil or a crayon.

Disclosed in US-A-3,797,475 are synthetic papers with acceptable foldability and comprised of a nonoriented structure of one thermoplastic resin film or a laminated structure of at least two thermoplastic resin films, see the Abstract of the Disclosure for example. Each of the films is stretched or molecularly oriented, and one or more of the films can contain a fine inorganic filler to provide paperiness of the film. According to this patent some of the films may contain certain amounts of polyethylene as a foldability improving agent.

Further, in US-A-4,092,965, there is illustrated a nonporous paper for ink jet printing comprised of a supporting substrate and thereover a coating of a blend of carboxymethyl cellulose and poly(ethylene oxide). Also, in this patent there is illustrated an ink jet paper wherein the surface coating or skin is comprised of poly(ethylene oxide).

In US-A-4,065,014, there are disclosed ink jet transpiration and ink jet papers with coatings thereover which are compatible with the inks selected for marking, and wherein the coatings enable acceptable optical density images to be obtained. More specifically, in one embodiment of the aforesaid patent there are provided coatings for ink jet paper comprised of a supporting substrate, and thereover a nonporous mixture of hydroxypropyl cellulose, carboxymethyl cellulose, poly(ethylene oxide), and colloidal silica.

Although the papers disclosed in the prior art are suitable for their intended purposes, there remains a need for papers with new coatings that are useful in ink jet printing processes, electrophotographic imaging and printing processes, including color processes, and that will enable the formulation of images with high optical densities. Additionally, there is a need for coated papers that can be selected for ink jet color printing processes. Another need resides in providing papers the fibers of which are coated individually with certain comonomers as illustrated herein. Further, there is a need for papers that avoid or minimize tearing at the fiber fold, thus shortening the life thereof. Also, there is a need for bleed-free papers, or wherein the static charge thereon is electrostatic substantially avoided. Another need resides in the provision of pro-

cesses for ink jet, raster, typographic and analog printing processes, and wherein images of high optical density, such as greater than one, are obtained in some embodiments of the present invention.

It is an object of the present invention to provide papers which meet these needs, and which are suitable for use as ink jet papers or xerographic papers.

According to the invention, there is provided a paper comprising a supporting substrate treated with, or having thereon a coating of, one or more treating agents selected from (1) hydrophilic poly(dialkyl siloxanes); (2) poly(ethylene glycol); (3) poly(propylene oxide) - poly(ethylene oxide) copolymers; (4) fatty ester modified compounds of phosphate, mercaptan, glycerol, poly(ethylene glycol), sulfosuccinic acid, sulfonic acid, silyl silane; (5) poly(oxypolyphenols) modified compounds of arithonic esters, fatty esters, silanol esters, ester oil, fatty acid, fatty alcohol; (6) quaternary siloxane compounds; (7) fatty imidazolines.

In one embodiment, the present invention relates to papers comprised of a supporting substrate surface coated preferably in a doctor press, or other apparatus used to coat or treat the paper during the drying process in a paper machine or a coating apparatus, such as a Dill's Doctor, with a mixture of doctor or rheoductor (rheoductor), much as gelatin, with the above-listed treating agents. The fibers in the surface treated papers may be coated with the aforementioned materials thereby reducing the levels of internal sizing and enabling, for example, these fibers to accept ink conditioning with abundant spreading thereof thus preventing or minimizing wicking, a major cause of undesirable print edge irregularities. The treating components can also be applied to paper fibers or a known water-borne aqueous or alcohol solution. The aforementioned treatments can be facilitated as indicated herein preferably in replicating the selection of these papers for use in liquid ink printing or improved print through, which modification can be accomplished by the addition of a binder polymer such as hydroxypropylmethyl cellulose, hydroxyethyl cellulose and the like.

The treating agent may be admixed with a color binder polymer, or may be dispersed in a resin binder polymer. This binder polymer may be a hydrophilic film forming binder polymer. The treating agent may be dispersed in or admixed in a film forming binder with filler components, and the filler components may comprise pigments such as titanium dioxide. The filler may be calcium silicate or barium sulfate.

The treating agent may be dispersed in, or admixed with, a hydrophilic film forming binder polymer, which polymer contains a mixture of filler components and glycerols.

The supporting substrate may be treated on both surfaces thereof with the treating agents.

Preferred hydrophilic poly(dialkyl siloxanes) are

(a) carbonated homopolymer polydimethyl siloxanes) collected from poly(ethylene oxide)-*g*-poly(dimethyl siloxane) block copolymers and poly(ethylene oxide)-*b*-poly(dimethyl siloxane)-*g*-poly(ethylene oxide) block copolymers; (b) polydimethyl siloxane)-*g*-poly(ethylene oxide)-*b*-poly(propylene oxide) block copolymers; (c) polydimethyl siloxane)-*g*-methyl siloxane siloxane oxide) block copolymers where siloxane is ethylene, propylene or ethylene-propylene; and (d) poly(methylene methacrylate) siloxanes.

dimethoxy poly(ethylene glycol), or poly(ethylene glycol); poly(ethylene glycol dimethacrylate); poly(ethylene glycol terephthalate); poly(ethylene glycol dimethacrylate); poly(ethylene glycol monomethacrylate); poly(ethylene glycol diglycidyl ether); poly(ethylene glycol dimethyl ether); or poly(4-methylpentene glycol).

transferred poly(pyrrolene oxide) - poly(ethylene oxide) copolymers are (a) a poly(pyrrolene oxide)-*b*-poly(ethylene oxide)-*b*-poly(pyrrolene oxide) triblock copolymer; (b) a poly(ethylene oxide)-*b*-poly(pyrrolene oxide)-*b*-poly(ethylene oxide)-*b*-poly(ethylene oxide) triblock copolymer; or (c) a tetrafunctional block copolymer obtained from the sequential addition of ethylene oxide and pyrrolene oxide to a suitable diamine.

Preferred ionic ester modified compounds are (a) mono or diesters of phosphates; (b) acrylate mono laurate, acrylate mono oleate and acrylate trioleate; (c) glyceryl mono oleate, glyceryl diolaurate, glyceryl trioleate; (d) poly(hydroxy glycol) mono oleate, poly(hydroxy glycol) mono laurate, poly(hydroxy glycol) diolaurate, poly(hydroxy glycol) trioleate, poly(hydroxy glycol) di-laurate, poly(hydroxy glycol) tri-laurate; (e) sodium oleoyl sulfosuccinate, acryloylated alcohol sulfosuccinate, acrylate sulfosuccinate ester of lauryl diethanolamides, sodium lauryl sulfosuccinate; (f) durylpyrimidine diolauryl benzene sulfonate, diolauryl thiodiary methacryl sulfonate; or (g) mono diethanol acrylate, lauryl diethanol acrylate, mono monomethyl acrylate, lauryl mono-methyl acrylate, lauryl mono terephthal acrylate, or lauryl diethanol acrylate.

Prepared acrylate, polyimide, modified compounds
are: (a) poly(arylethylene) arithon mono-carbonate,
poly(arylethylene) arithon mono-ester, poly(arylethylene)
arithon di-carbonate; (b) fatty amine ethoxygates,
methyl amine ethoxygates; (c) carbon di-ethoxygates;
(d) cocatalystamide ethoxygates; (e) oleic
acid ethoxygates, lauric acid ethoxygates, palmitic acid
ethoxygates; and (f) long alcohol ethoxygates, allyl
alcohol ethoxygates, fatty alcohol ethoxygates, nonyl
phenol ethoxygates, methyl phenol ethoxygates, or
alcohol ethoxygates.

Prepared quaternary silicates consist of (a) isopolymeric quaternary orthosilicates; (b) quaternary alkyl derivate metasilicates; (c) alkylated citric methosilicates quaternary; (d) quaternary siloxane methosilicates; or (e) quaternary siloxane methosilicates.

Profound body intoxications are (a) acute hemimyoethylnicotinic; (b) delirious; myoethylnicotinic; (c) delirious; myoethylnicotinic; (d) delirious; myoethylnicotinic; (e) delirious; myoethylnicotinic; (f) delirious; myoethylnicotinic; (g) delirious; myoethylnicotinic; (h) delirious; myoethylnicotinic; (i) delirious; myoethylnicotinic; (j) delirious; myoethylnicotinic; (k) delirious; myoethylnicotinic; (l) delirious; myoethylnicotinic; (m) delirious; myoethylnicotinic; (n) delirious; myoethylnicotinic; (o) delirious; myoethylnicotinic; (p) delirious; myoethylnicotinic; (q) delirious; myoethylnicotinic; (r) delirious; myoethylnicotinic; (s) delirious; myoethylnicotinic; (t) delirious; myoethylnicotinic; (u) delirious; myoethylnicotinic; (v) delirious; myoethylnicotinic; (w) delirious; myoethylnicotinic; (x) delirious; myoethylnicotinic; (y) delirious; myoethylnicotinic; (z) delirious; myoethylnicotinic.

Prepared cellulose polymers are (1) starch; (2) carboxyl starch; (3) gelatin; (4) hydroxypropylmethyl cellulose; (5) acetylatedhydroxypropyl cellulose; (6) hydroxyethyl cellulose; (7) sodium carboxymethylhydroxyethyl cellulose; (8) hydroxypropyl cellulose; (9) ethylhydroxyethyl cellulose; (10) methyl cellulose; (11) poly(acrylonitrile); (12) styrolene-butadiene copolymer; (13) poly(vinyl acetate); (14) poly(vinyl pyrrolidone); (15) poly(styrene-butadiene copolymer); (16) poly(2-acrylamido-2-methyl propane sulfonic acid); (17) poly(styrene oxide); (18) cellulose sulfate; (19) quaternary ammonium copolymers; (20) hydroxyethyl methyl cellulose; (21) vinyl methyl ether-butadiene acid copolymer; (22) poly(methylacrylate); quaternary; (23) hydroxyethyl methyl cellulose; or (24) cellulose hydroxyethyl methyl-036.

Prepared filler compositions are clay, calcium silicate, calcium carbonate, hybark® dibutyl, or cellulose materials; and the pigment compositions are comprised of calcium silicate, titanium dioxide, barium sulfate, or various dyes.

The dissolving agent may be present in an amount of about 0.25 to about 20 percent by weight of the paper, and the ratio of binder polymer to the dissolving agent may be from about 1 to about 20. The ratio of filler to binder polymer may be from about 0.1 to about 5.

The supporting substrate may be an internally etched paper with no surface sizing, a surface etched paper with no internal sizing, a surface and internally etched paper, an alkaline etched paper, an acid etched paper, a sized filter paper, or a sized filter pigmented paper. The substrate may be of a thickness of from about 50 to about 200 microns and the desizing treatment layer may be of a thickness of 0.2 micron to about 20 microns.

In contrast, the invention provides media papers wherein the fibers thereof are coated with black dicyanines thereto creating, for example, images to be developed thereon which dry in less than ten seconds and have acceptable optical density values, no intercolor bleeding and minimum sensitivity.

The invention also provides a device for use in a paper mill that permits the substantial elimination of loading caused by poor inter-deck clearances during making of the primary orders in particular secondary colors such as, for example, mixtures of cyan and yellow enabling green inks.

In addition, the invention provides absolutely biodegradable treated seed papers that enable elimination or minimization of leaching of colors due to leaching or diffusion of the dyes when different colors, for example, even red and yellow, are united.

together with another color like magenta.

This treated ink jet absorptive surface, for example, water and glycol absorption from the ink selected by a color monitor thereby permitting such papers to be aesthetically treated in bromine ink jet printers.

The coatings of the invention are compatible with lined papers and coated papers, which coatings will enable the aforementioned materials to generate high optical density images with electrophotographic processes utilizing, for example, liquid bromine compound of a laser beam such as silver if dispersed in a solvent such as isobutyl alcohol, and a charge transfer.

These and other advantages of the present invention are accomplished by providing treated papers. More specifically, in accordance with one embodiment of the present invention there is provided paper consisting of a supporting substrate treated with a solution of starch and dissolving agent, which papers are, for example, compatible with the ink jet printers selected for marking and wherein the papers readily acceptably applied density images to be obtained, especially in inkjet color printing processes. In one embodiment, there are provided papers treated with a mixture of starch and a dissolving agent such as isobutyl alcohol or poly(methylsiloxane)-*b*-poly(ethylene oxide)-*b*-poly(dimethylsiloxane)-*b*-poly(ethylene oxide) block copolymer wherein the fibers thereof are coated with the block copolymer solution, for example, wetting, avoiding, or orienting the layer of treated starch and rendering the paper more suitable for ink jet printing.

The present invention teaches a rapid drying ink jet paper with substantially no color change and intercolor bleed values equivalent to a paper with no internal or external coating. This can be achieved by, for example, basing such papers with dissolving agents which penetrate into the paper, lift the starch from the fibers and reorienting the starch molecules in the bulk of the paper which results in a reconditioning print through conditions. The dissolving agents can be applied on a known surface substantially any commercially available paper and thereby convert it to an ink jet paper. This treatment can also be effected to an inherently absorbent paper of the same type by incorporating the dissolving agent into starch or any other similar binder material.

Embodiments of the present invention include a paper consisting of a coated supporting substrate such as a glass paper treated with dissolving agents, that is a polyacetal or nonpolymeric material which will remove the starch impurities deposited on the fibers of cellulose during the paper making process thereby reducing the starch levels in paper, which dissolving agents are comprised of (1) nonaqueous poly(dimethylsiloxane)s such as water soluble carbamate terminated poly(dimethylsiloxane)s with weight average molecular weight of, for example, from about 1,000 to about 5,000, water soluble poly(dimethylsiloxane)s terminated or poly quaternary

poly(dimethylsiloxane) with a dimethylsiloxane content of from about 15 to 20 percent by weight with weight average molecular weight of, for example, from about 1,000 to 100,000; (2) poly(dimethylsiloxane)-*b*-poly(alkylene oxide)s and poly(dimethylsiloxane)-*b*-poly(methylsiloxane) alkylene oxide)s water soluble block copolymers with a weight average molecular weight of, for example, from about 1,000 to about 5,000 and dimethylsiloxane content of from about 15 to about 20 percent by weight, where alkylene contains from 1 to about 20 carbon atoms such as ethylene, propylene and ethylene propylene; (3) methanol and water soluble poly(methylene oxide)-poly(ethylene oxide) block copolymers with a propylene oxide content of about 25 to about 50 percent and a weight average molecular weight of from about 500 to 100,000; (4) alcohol soluble, such as methanol or ethanol, and the like, poly(propylene glycol) with a weight average molecular weight of between about 400 to about 5,000, and alcohol soluble poly(propylene glycol dimethylsiloxane)s with weight average molecular weight of between about 500 to about 5,000; (5) alcohol soluble fatty esters of phosphoric, glyceric, sorbitic, mono and diethyl sebacic, sebacic acid, and sulfosuccinic acid; (6) alcohol soluble alkeneamines, alkeneamino alcohols and amine alcohols; (7) water soluble nonpolymeric quaternary ammonium ether sulfates; (8) fatty terminated quaternized water and alcohol soluble and nonquaternized alcohol soluble fatty sulfates; and (9) alcohol and water soluble fatty alcohol modified poly(arylethers) and mixtures thereof, which dissolving agents can be dispersed in a resin binder or mixtures of binders and a filler or fillers. When these dissolving agents are applied to paper, they are generally present in effective amounts of from about 1 to about 20 percent by weight in water or alcohol, and preferably from about 1 to about 10 percent by weight in water. Preferably mixtures of these low cost and versatile products, dissolving agents which are soluble in water are preferred.

In another embodiment of the present invention there is provided a paper comprised of a supporting substrate treated with dissolving agents selected from the group consisting of (1) hydrophilic poly(dimethylsiloxane)s; (2) poly(ethylene glycol), the carbamate thereof; (3) poly(propylene oxide)-poly(ethylene oxide) copolymers; (4) fatty ester modified compounds of phosphoric, sorbitic, glyceric, poly(ethylene glycol), sulfosuccinic acid, sebacic acid, or alkyl sebacic; (5) poly(arylethers) modified compounds of sorbitic, sebacic, fatty amines, alkene amines, alcohols, fatty acid, fatty alcohol; (6) quaternary ammonium ether sulfates; and (7) fatty sulfates and mixtures thereof; a paper comprised of a supporting substrate with a coating comprised of a dissolving monomer dispersed or admixed with a binder reaction polymer, or the alternative

tioned papers wherein the desizing agent is present in a resin, preferably hydrophilic, polymer binder.

The binder polymers which are used in combination with the desizing agents are, for example, selected from the group consisting of: (1) starch; (2) carboxy starch; (3) gelatin; (4) hydroxyethylmethacrylate cellulose where alkyl is from 1 to about 25 carbon atoms such as methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, and the like; (5) methacryloylmethyl cellulose; (6) acrylate methacryloylmethylhydroxyethyl cellulose; (7) hydroxyethyl cellulose; (8) hydroxypropyl cellulose; (9) ethylhydroxyethyl cellulose where ethyl is from 1 to about 25 carbon atoms such as methyl, ethyl, propyl, butyl, and the like; (10) methyl cellulose; (11) poly(acrylamides); (12) an acrylamide-maleic acid copolymer; (13) poly(vinyl alcohol); (14) polyvinyl pyrrolidone; (15) poly(ethylene imine) hydroxyethyl ether; (16) poly(2-acrylamido-2-methylpropane sulfonic acid); (17) poly(styrene oxide); (18) cellulose acetate; (19) quaternary ammonium cetyltrimethyl ammonium; (20) hydroxyethylmethacrylate cellulose; (21) vinyl methyl ether/acrylonitrile acid copolymer; (22) poly(hexamethylenes) quarternized; (23) hydroxyethyl methyl cellulose; (24) cellulose acetates; (25) silanes or siloxanes treated with siloxanes and celluloses being arbitrarily preferred primarily because of their availability and applicability to paper; and the like. Mixtures of various kinds of the binder components in effective amounts as indicated herein including, for example, from about 5 to about 50 weight percent of one material, say about 50 to about 5 weight percent of a second material. Generally, the ratio of binder to desizing agent depends on the coarseness of the desizing agent to desize paper but commonly this ratio varies from about 1 to about 10 to six parts and from about 1 to about 20 in coating applications. Also, note that two treatments can also be selected, thus, for example, up to five treatments may be included in the blends providing some of the objectives of the present invention are satisfactorily met; if the compositions being present in an effective amount whereby the total amount of silicate treatments is equal to about 100 percent.

The ink or color recording surface where the developed image is contained by an embodiment of the present invention may include lightening fiber components in various effective amounts such as, for example, from about 1 to about 50 percent by weight. Examples of fibers include colloidal silica (available, for example, as Hydrol 74 from Grace Company); talc; or other pigments, for example, in one embodiment in an amount of 20 weight percent; titanium dioxide (available as Riton or Aerodur from NL Chem. Canada Inc.); hydrated alumina (Hydrol 340-440, Hydrol 744-880, J.M. Huber Corporation); heavy sulfur (J.C. Waco Fib 11000, available from J.M. Chemical Corporation, and calcium carbonate (Monsanto Hydroxide Calcium Products); light brightening dyes

(Engelhard Paper Clays); low plastic pigments (723, 788 Dow Chemicals); calcium silicate (J.M. Huber Corporation); insoluble cellulose acetate (Schoncke Polymer Products); and the like. The primary purpose of this lightening filler is to enhance color mixing and assist in improving print-through in an embodiment of the present invention.

In an embodiment of the present invention, the substrate is comprised of above blends of hardwood kraft and softwood kraft fibers which blends contain from about 10 percent to 90 percent by weight of softwood and from about 10 to about 90 percent by weight of hardwood. Examples of hardwood include Douglas fir, dry bleached hardwood kraft preferably present, for example, in one embodiment in an amount of 20 percent by weight. Examples of softwood include Le Tique dry bleached softwood kraft present, for example, in one embodiment in an amount of 20 percent by weight. These blend combinations may also contain fibers and pigments in effective amounts of from about 1 to about 60 percent by weight such as clay (available from Georgia Kaolin Company, Azo 33 33 clay Engelhard America Corp), titanium dioxide (available fromioxide Company - Aerodur grade 4500, colloidal silica CH-427-57-6, XN-876 (J.M. Huber Corporation), and the like. Also, the above substrates may contain various effective amounts of other chemicals (for example from about 2.25 percent to about 25 percent by weight of poly) such as Menobac (available from Monsanto Company), Hetero-20 (available from Hercules Company), Aum (available from Allied Chemicals or from Hoechst), and carbon fiber and available from Allied Chemicals or Percol 202). The sizing values of papers, including the commercial papers that can be selected for the present invention in an embodiment thereof, vary between about 1.5 seconds to about 4,500 seconds, however, papers in the sizing range of 50 seconds to 300 seconds are preferred, primarily in decrease costs. The primary values of the substrates which are preferably prime varies from about 100 to about 1,250 milligrams and preferably from about 100 to about 500 milligrams to point. For example, the use of these papers for various printing technologies such as thermal transfer, liquid toner development, serigraphy, ink jet processes, and the like.

Illustrative examples of commercially available, internally and externally (surface) coated substrates that may be selected for the present invention and are treated with a desizing agent dispersed in an optional binder with a thickness of, for example, from about 30 μ m to about 200 μ m and preferably of a thickness of from about 100 μ m to about 125 μ m that may be selected for the aforementioned papers include filter papers, offset papers such as Green Leafan offset, recycled papers such as Conservecra, offset papers such as Azobrimen, Eddy liquid toner paper and copy papers from companies such as Nektara, Champion,

Veigging Teape, Hyman, Mada, Doster, Vohallur, and Gough with Xerox 4024TM papers and sized calcium silicate clay filled papers being particularly preferred in view of their availability, solubility, and low tint through.

Specific examples of dissolving agents that can be selected for the dissolving or coating on a single side, or both sides thereof of papers include (i) hydrophilic polyvinylalcohol oligomers such as (a) Poly(vinylalcohol) intercarbinol terminated (P2555), Paracel Systems Inc.) and alcoholated terminated (P2556, P2557, Paracel Systems Inc.); (b) poly(vinylalcohol)-*g*-poly(vinylalcohol) alcohols ethylene oxide copolymers (P2557S, P2557T, P2557U, Paracel Systems Inc.); Alkacel HEP 122-220, Alkacel HEP 122-221, Alkacel Chemicals, non-hydrolyzable copolymers containing 51-61 linkages; (c) poly(vinylalcohol)-*g*-poly(propylene oxide)-*g*-poly(ethylene oxide) copolymers (Alkacel HEP 72-7U, Alkacel Chemicals), hydrolyzable copolymer containing 51-61 linkages; (d) poly monomeric poly(vinylalcohol) oligomers which can be obtained by the addition reaction of α , ω -hydroxy polyethers with epoxides containing olefinic bonds and then reacting the product with a diisocyanate; (e) poly(ethylene glycol) and its derivatives (a) poly(propylene glycol) (Alkacel HEP-225, Alkacel PPG-4000, Alkacel Chemicals); (b) poly(propylene glycol) derivatives (a) poly(ethylene glycol) diacrylate, poly(ethylene glycol) methacrylate, acrylate-ethylene glycol methacrylate, vinyl, poly(ethylene glycol) dimethyl ether, poly(ethylene glycol) diglycidyl ether (all from Polysciences); (c) poly(1,4-bis(hydroxy)ethylene glycol) (Scientific Polymer Products); (d) copolymers of hydroxy poly(propylene oxides) with hydroxy poly(ethylene oxides); (e) methacrylate esters - Teflon 1500, Fluon 1-101, Teflon 1002, Teflon 1000 (BASF Corporation), Alkacel 255-1 (Alkacel Chemicals); (f) water soluble - Teflon 200, 200A, 200B, 200C, 200D, Fluon 1-101, Teflon 1002 (BASF Corporation, and Alkacel 255-2 and 255-3 from Alkacel Chemicals); (g) fatty ester modifications of (a) phosphates (Alkacel 255-1A, Alkacel Chemicals); (b) sorbitan (Alkacel STC sorbitan esters, Alkacel SAE, sorbitan mono laurate, Alkacel SMO sorbitan mono laurate, Alkacel Chemicals); (c) glycerate (Alkacel GAO - 4500 glyceryl mono oleate, Alkacel GAO glyceryl dioleate, Alkacel GAO glyceryl trioleate); (d) poly(ethylene glycol) (Alkacel 500 DC tri oleate, Alkacel 400-10, mono laurate, Alkacel 500 MC mono oleate, Alkacel 500 U, dioleate, Alkacel 500 DT, trioleate, Alkacel Chemicals); (e) sulfonate acid (Alkacel 55-C-75 sodium decyl sulfonate), Alkacel 55-DA4-1E tetraethylammonium sulfonate, Alkacel 55-1.7UE sodium sulfonate ester of lauryl diethanol amide, Alkacel 55-1.1E (sorbitan lauryl sulfonate), Alkacel Chemicals); (f) sulfonic acid (Alkacel GA, calcium decyl ben-

zene sulfonate), Alkacel 7 FAD (sarcosylsulfonate decyl benzene sulfonate), Alkacel Chemicals); (g) alkyl amines (Alkacel STC lauryl diethanol amide, Alkacel CDE lauryl diethanol amide, Alkacel CDE lauryl monoethanol amide, Alkacel 1.5DE lauryl diethanol amide, Alkacel 1.7DE lauryl monoethanol amide, Alkacel 1.1DE lauryl monoethanol amide), Alkacel Chemicals); (h) poly(vinylalcohol) modifications of (a) sorbitan esters (Alkacel P255A-1 tri(vinylalcohol) sorbitan mono laurate, Alkacel P255A-2 poly(vinylalcohol) sorbitan mono laurate), Alkacel P255A-20 poly(vinylalcohol) sorbitan mono laurate, Alkacel P255A-20 poly(vinylalcohol) sorbitan mono laurate, Alkacel Chemicals); (b) fatty amines (Alkacel T-2, T-3 fatty amine ethoxylates, Alkacel T-5, T-6 fatty amine ethoxylates, Alkacel T-8, T-9 fatty amine ethoxylates, Alkacel Chemicals); (c) sorbitan (Alkacel DC-10 sorbitan mono laurate, Alkacel Chemicals); (d) alkyl amide (Alkacel C-2, C-3, C-4, C-5, C-6, C-7, C-8, C-9, C-10, C-11, C-12, C-13, C-14, C-15, C-16, C-17, C-18, C-19, C-20, C-21, C-22, C-23, C-24, C-25, C-26, C-27, C-28, C-29, C-30, C-31, C-32, C-33, C-34, C-35, C-36, C-37, C-38, C-39, C-40, C-41, C-42, C-43, C-44, C-45, C-46, C-47, C-48, C-49, C-50, C-51, C-52, C-53, C-54, C-55, C-56, C-57, C-58, C-59, C-60, C-61, C-62, C-63, C-64, C-65, C-66, C-67, C-68, C-69, C-70, C-71, C-72, C-73, C-74, C-75, C-76, C-77, C-78, C-79, C-80, C-81, C-82, C-83, C-84, C-85, C-86, C-87, C-88, C-89, C-90, C-91, C-92, C-93, C-94, C-95, C-96, C-97, C-98, C-99, C-100, C-101, C-102, C-103, C-104, C-105, C-106, C-107, C-108, C-109, C-110, C-111, C-112, C-113, C-114, C-115, C-116, C-117, C-118, C-119, C-120, C-121, C-122, C-123, C-124, C-125, C-126, C-127, C-128, C-129, C-130, C-131, C-132, C-133, C-134, C-135, C-136, C-137, C-138, C-139, C-140, C-141, C-142, C-143, C-144, C-145, C-146, C-147, C-148, C-149, C-150, C-151, C-152, C-153, C-154, C-155, C-156, C-157, C-158, C-159, C-160, C-161, C-162, C-163, C-164, C-165, C-166, C-167, C-168, C-169, C-170, C-171, C-172, C-173, C-174, C-175, C-176, C-177, C-178, C-179, C-180, C-181, C-182, C-183, C-184, C-185, C-186, C-187, C-188, C-189, C-190, C-191, C-192, C-193, C-194, C-195, C-196, C-197, C-198, C-199, C-200, C-201, C-202, C-203, C-204, C-205, C-206, C-207, C-208, C-209, C-210, C-211, C-212, C-213, C-214, C-215, C-216, C-217, C-218, C-219, C-220, C-221, C-222, C-223, C-224, C-225, C-226, C-227, C-228, C-229, C-230, C-231, C-232, C-233, C-234, C-235, C-236, C-237, C-238, C-239, C-240, C-241, C-242, C-243, C-244, C-245, C-246, C-247, C-248, C-249, C-250, C-251, C-252, C-253, C-254, C-255, C-256, C-257, C-258, C-259, C-260, C-261, C-262, C-263, C-264, C-265, C-266, C-267, C-268, C-269, C-270, C-271, C-272, C-273, C-274, C-275, C-276, C-277, C-278, C-279, C-280, C-281, C-282, C-283, C-284, C-285, C-286, C-287, C-288, C-289, C-290, C-291, C-292, C-293, C-294, C-295, C-296, C-297, C-298, C-299, C-300, C-301, C-302, C-303, C-304, C-305, C-306, C-307, C-308, C-309, C-310, C-311, C-312, C-313, C-314, C-315, C-316, C-317, C-318, C-319, C-320, C-321, C-322, C-323, C-324, C-325, C-326, C-327, C-328, C-329, C-330, C-331, C-332, C-333, C-334, C-335, C-336, C-337, C-338, C-339, C-340, C-341, C-342, C-343, C-344, C-345, C-346, C-347, C-348, C-349, C-350, C-351, C-352, C-353, C-354, C-355, C-356, C-357, C-358, C-359, C-360, C-361, C-362, C-363, C-364, C-365, C-366, C-367, C-368, C-369, C-370, C-371, C-372, C-373, C-374, C-375, C-376, C-377, C-378, C-379, C-380, C-381, C-382, C-383, C-384, C-385, C-386, C-387, C-388, C-389, C-390, C-391, C-392, C-393, C-394, C-395, C-396, C-397, C-398, C-399, C-400, C-401, C-402, C-403, C-404, C-405, C-406, C-407, C-408, C-409, C-410, C-411, C-412, C-413, C-414, C-415, C-416, C-417, C-418, C-419, C-420, C-421, C-422, C-423, C-424, C-425, C-426, C-427, C-428, C-429, C-430, C-431, C-432, C-433, C-434, C-435, C-436, C-437, C-438, C-439, C-440, C-441, C-442, C-443, C-444, C-445, C-446, C-447, C-448, C-449, C-450, C-451, C-452, C-453, C-454, C-455, C-456, C-457, C-458, C-459, C-460, C-461, C-462, C-463, C-464, C-465, C-466, C-467, C-468, C-469, C-470, C-471, C-472, C-473, C-474, C-475, C-476, C-477, C-478, C-479, C-480, C-481, C-482, C-483, C-484, C-485, C-486, C-487, C-488, C-489, C-490, C-491, C-492, C-493, C-494, C-495, C-496, C-497, C-498, C-499, C-500, C-501, C-502, C-503, C-504, C-505, C-506, C-507, C-508, C-509, C-510, C-511, C-512, C-513, C-514, C-515, C-516, C-517, C-518, C-519, C-520, C-521, C-522, C-523, C-524, C-525, C-526, C-527, C-528, C-529, C-530, C-531, C-532, C-533, C-534, C-535, C-536, C-537, C-538, C-539, C-540, C-541, C-542, C-543, C-544, C-545, C-546, C-547, C-548, C-549, C-550, C-551, C-552, C-553, C-554, C-555, C-556, C-557, C-558, C-559, C-560, C-561, C-562, C-563, C-564, C-565, C-566, C-567, C-568, C-569, C-570, C-571, C-572, C-573, C-574, C-575, C-576, C-577, C-578, C-579, C-580, C-581, C-582, C-583, C-584, C-585, C-586, C-587, C-588, C-589, C-590, C-591, C-592, C-593, C-594, C-595, C-596, C-597, C-598, C-599, C-600, C-601, C-602, C-603, C-604, C-605, C-606, C-607, C-608, C-609, C-610, C-611, C-612, C-613, C-614, C-615, C-616, C-617, C-618, C-619, C-620, C-621, C-622, C-623, C-624, C-625, C-626, C-627, C-628, C-629, C-630, C-631, C-632, C-633, C-634, C-635, C-636, C-637, C-638, C-639, C-640, C-641, C-642, C-643, C-644, C-645, C-646, C-647, C-648, C-649, C-650, C-651, C-652, C-653, C-654, C-655, C-656, C-657, C-658, C-659, C-660, C-661, C-662, C-663, C-664, C-665, C-666, C-667, C-668, C-669, C-670, C-671, C-672, C-673, C-674, C-675, C-676, C-677, C-678, C-679, C-680, C-681, C-682, C-683, C-684, C-685, C-686, C-687, C-688, C-689, C-690, C-691, C-692, C-693, C-694, C-695, C-696, C-697, C-698, C-699, C-700, C-701, C-702, C-703, C-704, C-705, C-706, C-707, C-708, C-709, C-710, C-711, C-712, C-713, C-714, C-715, C-716, C-717, C-718, C-719, C-720, C-721, C-722, C-723, C-724, C-725, C-726, C-727, C-728, C-729, C-730, C-731, C-732, C-733, C-734, C-735, C-736, C-737, C-738, C-739, C-740, C-741, C-742, C-743, C-744, C-745, C-746, C-747, C-748, C-749, C-750, C-751, C-752, C-753, C-754, C-755, C-756, C-757, C-758, C-759, C-760, C-761, C-762, C-763, C-764, C-765, C-766, C-767, C-768, C-769, C-770, C-771, C-772, C-773, C-774, C-775, C-776, C-777, C-778, C-779, C-780, C-781, C-782, C-783, C-784, C-785, C-786, C-787, C-788, C-789, C-790, C-791, C-792, C-793, C-794, C-795, C-796, C-797, C-798, C-799, C-800, C-801, C-802, C-803, C-804, C-805, C-806, C-807, C-808, C-809, C-810, C-811, C-812, C-813, C-814, C-815, C-816, C-817, C-818, C-819, C-820, C-821, C-822, C-823, C-824, C-825, C-826, C-827, C-828, C-829, C-830, C-831, C-832, C-833, C-834, C-835, C-836, C-837, C-838, C-839, C-840, C-841, C-842, C-843, C-844, C-845, C-846, C-847, C-848, C-849, C-850, C-851, C-852, C-853, C-854, C-855, C-856, C-857, C-858, C-859, C-860, C-861, C-862, C-863, C-864, C-865, C-866, C-867, C-868, C-869, C-870, C-871, C-872, C-873, C-874, C-875, C-876, C-877, C-878, C-879, C-880, C-881, C-882, C-883, C-884, C-885, C-886, C-887, C-888, C-889, C-890, C-891, C-892, C-893, C-894, C-895, C-896, C-897, C-898, C-899, C-900, C-901, C-902, C-903, C-904, C-905, C-906, C-907, C-908, C-909, C-910, C-911, C-912, C-913, C-914, C-915, C-916, C-917, C-918, C-919, C-920, C-921, C-922, C-923, C-924, C-925, C-926, C-927, C-928, C-929, C-930, C-931, C-932, C-933, C-934, C-935, C-936, C-937, C-938, C-939, C-940, C-941, C-942, C-943, C-944, C-945, C-946, C-947, C-948, C-949, C-950, C-951, C-952, C-953, C-954, C-955, C-956, C-957, C-958, C-959, C-960, C-961, C-962, C-963, C-964, C-965, C-966, C-967, C-968, C-969, C-970, C-971, C-972, C-973, C-974, C-975, C-976, C-977, C-978, C-979, C-980, C-981, C-982, C-983, C-984, C-985, C-986, C-987, C-988, C-989, C-990, C-991, C-992, C-993, C-994, C-995, C-996, C-997, C-998, C-999, C-1000, C-1001, C-1002, C-1003, C-1004, C-1005, C-1006, C-1007, C-1008, C-1009, C-1010, C-1011, C-1012, C-1013, C-1014, C-1015, C-1016, C-1017, C-1018, C-1019, C-1020, C-1021, C-1022, C-1023, C-1024, C-1025, C-1026, C-1027, C-1028, C-1029, C-1030, C-1031, C-1032, C-1033, C-1034, C-1035, C-1036, C-1037, C-1038, C-1039, C-1040, C-1041, C-1042, C-1043, C-1044, C-1045, C-1046, C-1047, C-1048, C-1049, C-1050, C-1051, C-1052, C-1053, C-1054, C-1055, C-1056, C-1057, C-1058, C-1059, C-1060, C-1061, C-1062, C-1063, C-1064, C-1065, C-1066, C-1067, C-1068, C-1069, C-1070, C-1071, C-1072, C-1073, C-1074, C-1075, C-1076, C-1077, C-1078, C-1079, C-1080, C-1081, C-1082, C-1083, C-1084, C-1085, C-1086, C-1087, C-1088, C-1089, C-1090, C-1091, C-1092, C-1093, C-1094, C-1095, C-1096, C-1097, C-1098, C-1099, C-1100, C-1101, C-1102, C-1103, C-1104, C-1105, C-1106, C-1107, C-1108, C-1109, C-1110, C-1111, C-1112, C-1113, C-1114, C-1115, C-1116, C-1117, C-1118, C-1119, C-1120, C-1121, C-1122, C-1123, C-1124, C-1125, C-1126, C-1127, C-1128, C-1129, C-1130, C-1131, C-1132, C-1133, C-1134, C-1135, C-1136, C-1137, C-1138, C-1139, C-1140, C-1141, C-1142, C-1143, C-1144, C-1145, C-1146, C-1147, C-1148, C-1149, C-1150, C-1151, C-1152, C-1153, C-1154, C-1155, C-1156, C-1157, C-1158, C-1159, C-1160, C-1161, C-1162, C-1163, C-1164, C-1165, C-1166, C-1167, C-1168, C-1169, C-1170, C-1171, C-1172, C-1173, C-1174, C-1175, C-1176, C-1177, C-1178, C-1179, C-1180, C-1181, C-1182, C-1183, C-1184, C-1185, C-1186, C-1187, C-1188, C-1189, C-1190, C-1191, C-1192, C-1193, C-1194, C-1195, C-1196, C-1197, C-1198, C-1199, C-1200, C-1201, C-1202, C-1203, C-1204, C-1205, C-1206, C-1207, C-1208, C-1209, C-1210, C-1211, C-1212, C-1213, C-1214, C-1215, C-1216, C-1217, C-1218, C-1219, C-1220, C-1221, C-1222, C-1223, C-1224, C-1225, C-1226, C-1227, C-1228, C-1229, C-1230, C-1231, C-1232, C-1233, C-1234, C-1235, C-1236, C-1237, C-1238, C-1239, C-1240, C-1241, C-1242, C-1243, C-1244, C-1245, C-1246, C-1247, C-1248, C-1249, C-1250, C-1251, C-1252, C-1253, C-1254, C-1255, C-1256, C-1257, C-1258, C-1259, C-1260, C-1261, C-1262, C-1263, C-1264, C-1265, C-1266, C-1267, C-1268, C-1269, C-1270, C-1271, C-1272, C-1273, C-1274, C-1275, C-1276, C-1277, C-1278, C-1279, C-1280, C-1281, C-1282, C-1283, C-1284, C-1285, C-1286, C-1287, C-1288, C-1289, C-1290, C-1291, C-1292, C-1293, C-1294, C-1295, C-1296, C-1297, C-1298, C-1299, C-1300, C-1301, C-1302, C-1303, C-1304, C-1305, C-1306, C-1307, C-1308, C-1309, C-1310, C-1311, C-1312, C-1313, C-1314, C-1315, C-1316, C-1317, C-1318, C-1319, C-1320, C-1321, C-1322, C-1323, C-1324, C-1325, C-1326, C-1327, C-1328, C-1329, C-1330, C-1331, C-1332, C-1333, C-1334, C-1335, C-1336, C-1337, C-1338, C-1339, C-1340, C-1341, C-1342, C-1343, C-1344, C-1345, C-1346, C-1347, C-1348, C-1349, C-1350, C-1351, C-1352, C-1353, C-1354, C-1355, C-1356, C-1357, C-1358, C-1359, C-1360, C-1361, C-1362, C-1363, C-1364, C-1365, C-1366, C-1367, C-1368, C-1369, C-1370, C-1371, C-1372, C-1373, C-1374, C-1375, C-1376, C-1377, C-1378, C-1379, C-1380, C-1381, C-1382, C-1383, C-1384, C-1385, C-1386, C-1387, C-1388, C-1389, C-1390, C-1391, C-1392, C-1393, C-1394, C-1395, C-1396, C-1397, C-1398, C-1399, C-1400, C-1401, C-1402, C-1403, C-1404, C-1405, C-1406, C-1407, C-1408, C-1409, C-1410, C-1411, C-1412, C-1413, C-1414, C-1415, C-1416, C-1417, C-1418, C-1419, C-1420, C-1421, C-1422, C-1423, C-1424, C-1425, C-1426, C-1427, C-1428, C-1429, C-1430, C-1431, C-1432, C-1433, C-1434, C-1435, C-1436, C-1437, C-1438, C-1439, C-1440, C-1441, C-1442, C-1443, C-1444, C-1445, C-1446, C-1447, C-1448, C-1449, C-1450, C-1451, C-1452, C-1453, C-1454, C-1455, C-1456, C-1457, C-1458, C-1459, C-1460, C-1461, C-1462, C-1463, C-1464, C-1465, C-1466, C-1467, C-1468, C-1469, C-1470, C-1471, C-1472, C-1473, C-1474, C-1475, C-1476, C-1477, C-1478, C-1479, C-1480, C-1481, C-1482, C-1483, C-1484, C-1485, C-1486, C-1487, C-1488, C-1489, C-1490, C-1491, C-1492, C-1493, C-1494, C-1495, C-1496, C-1497, C-1498, C-1499, C-1500, C-1501, C-1502, C-1503, C-1504, C-1505, C-1506, C-1507, C-1508, C-1509, C-1510, C-1511, C-1512, C-1513, C-1514, C-1515, C-1516, C-1517, C-1518, C-1519, C-1520, C-1521, C-1522, C-1523, C-1524, C-1525, C-1526, C-1527, C-1528, C-1529, C-1530, C-1531, C-1532, C-1533, C-1534, C-1535, C-1536, C-1537, C-1538, C-1539, C-1540, C-1541, C-1542, C-1543, C-1544, C-1545, C-1546, C-1547, C-1548, C-1549, C-1550, C-1551, C-1552, C-1553, C-1554, C-1555, C-1556, C-1557, C-1558, C-1559, C-1560, C-1561, C-1562, C-1563, C-1564, C-1565, C-1566, C-1567, C-1568, C-1569, C-1570, C-1571, C-1572, C-1573, C-1574, C-1575, C-1576, C-1577, C-1578, C-1579, C-1580, C-1581, C-1582, C-1583, C-1584, C-1585, C-1586, C-1587, C-1588, C-1589, C-1590, C-1591, C-1592, C-1593, C-1594, C-1595, C-1596, C-1597, C-1598, C-1599, C-1600, C-1601, C-1602, C-1603, C-1604, C-1605, C-1606, C-1607, C-1608, C-1609, C-1610, C-1611, C-1612, C-1613, C-1614, C-1615, C-1616, C-1617, C-1618, C-1619, C-1620, C-1621, C-1622, C-1623, C-1624, C-1625, C-1626, C-1627, C-1628, C-1629, C-1630, C-1631, C-1632, C-1633, C-1634, C-1635, C-1636, C-1637, C-1638, C-1639, C-1640, C-1641, C-1642, C-1643, C-1644, C-1645, C-1646, C-1647, C-1648, C-1649, C-1650, C-1651, C-1652, C-1653, C-1654, C-1655, C-1656, C-1657, C-1658, C-1659, C-1660, C-1661, C-1662, C-1663, C-1664, C-1665, C-1666, C-1667, C-1668, C-1669, C-1670, C-1671, C-1672, C-1673, C-1674, C-1675, C-1676, C-1677, C-1678, C-1679, C-1680, C-1681, C-1682, C-1683, C-1684, C-168

papers of the present invention can be prepared in a single or multipass process and wherein different components are selected, for example, or other processes are utilized.

In other specific process embodiments, the papers of the present invention are prepared by providing a substrate such as Xerox 4024TM acidic sized porous paper of 108 µm in thickness and applying on the paper a mixture of colloidal silica, 10 percent by weight, acrylonitrile butadiene polydimethyl siloxane-b-polyethylene oxide) block copolymer, 2 percent by weight, poly(methacrylic) quaternized, 1 percent by weight, from a 5 percent by weight solution in water on a slot press. The thickness of the treatment blend after drying the paper at 100°C was measured at 1 µm. These papers were fed in a Xerox 1075TM imaging apparatus and images with optical density values of 1.3 black were obtained with a print through value of 0.055. These microtextured papers were also printed with a Xerox 4020TM ink jet printer and images with optical density values of 1.01 (black), 1.02 (magenta), 0.97 (cyan), 0.86 (yellow) were obtained which had a print through value of 0.105. These images could not be mechanically lifted off with a 3M Scotch tape 50 seconds subsequent to their preparation.

In another process embodiment, the papers of the present invention are prepared by providing a porous acidic sized substrate film with calcium chloride and clay, in a thickness of 125 µm, and applying to both sides on a slot press, in a thickness of 0.2 µm, a coating agent such as Clordan A7-172, which was present in a concentration of 2 percent by weight in water. Thereafter, the paper can be air dried at 100°C and the resulting paper is fed (manually) into a Xerox 4020TM ink jet printer to obtain images of high optical density, no edge degradation and a print through value of 0.065.

In the known formation and development of xerographic images, there is generally applied to a latent image generated on a photoconductive member a toner composition (dry or liquid) of resin particles and pigment particles. Thereafter, the image can be developed to a suitable degree such as required for use. The treated papers of the present invention, or similar paper and other media, by, for example, heat, pressure or combination thereof.

The imaging technique in ink jet printing involves the use of one or more ink jet assemblies composed of a pressurized source of ink, which is comprised of water, glycerol, and colorant such as magenta, cyan, yellow or black dyes. Each individual ink jet includes a very small orifice usually of a diameter of 51 µm, which is energized by magnetic electrostatic pressure to the purpose of creating a continuous stream of uniform droplets of ink at a rate of 23 to 75 kilohertz. This stream of droplets is precisely directed onto the surface of a moving web of, for example, the

treated paper of the present invention, which stream is controlled to control the formation of printed characters in response to video signals derived from an electronic character generator and in response to an electrostatic deflection system.

In thermal transfer printing, the printer such as an Okiwrite 20 is equipped with a data input interface, provided, a three color, such as magenta, cyan and yellow, transfer ribbon, a mechanism to continuously line combination of heat, paper and ribbon tension, and a properly qualified output material. The data from the input interface is fed to the thermal head which makes contact with the back of the ribbon substrate and melts the ink. The melted ink is then transferred to the treated paper of the present invention.

In dot matrix printing, the printer such as a Roland PB-1032 is connected to an IBM-PC compatible system with a microcomputer software specially supplied by the printer. Any graphic images produced by the computer's software on the computer can be printed by using the print screen key on the computer keyboard. The ribbons used in dot matrix printers are generally composed of Mylar coated with blends of carbon black with yellow, blue, cyan, magenta, red, and a surfactant such as lecithin. Other nonmaterial ribbons, which are also used in typewriter printing, can be selected and are usually composed of Mylar coated with blends of acrylonitrile, carbon black and mineral oil.

The drying time of images obtained with the treated papers of the present application is the time for each image to dry and can be measured as follows: a line comprising of different color sequences is drawn on the ink jet paper using the sequence of ink from the inkjet heads moving from left to right and back. Thereafter, the image is purposely processed with the pinch roll of the printer by fast forwarding the paper mechanically until the pinch roll is at the top of the imaged line. This whole procedure takes about two seconds to accomplish. In the event there is no effect of the printed image on the unprinted paper, the drying time of the image is considered as less than two seconds.

The Hercules size values defined herein were measured in the Hercules sizing water phenolase incorporated for described in TAPPI STANDARD T-503 pm-25 devised by the Technical Association of the Pulp and Paper Industry. This method is closely related to the widely used ink fixation test. The TAPPI method has the advantage over the ink fixation test of detecting the end point photoacoustically. The TAPPI method employs a mildly acidic aqueous dye solution as the porochromic component; normal optical detection of the liquid front as it moves through the paper shows. The apparatus determines the time required for the resistance of the sheet surface not in contact with the porochromic drop to a predetermined (50 percent)

2.17); (3) hydroxypropyl cellulose (Mucal Type E, Hercules); (9) water soluble ethylhydroxyethyl cellulose (Dinacel, Boral Nor, AG, Sweden); (10) methyl cellulose (Mucelcol A44, Lavi Chemical Company); (11) poly(acrylonitrile) (Scientific Polymer Products); (12) acrylonitrile-styrene and copolymer (Scientific Polymer Products); (13) poly(vinyl alcohol) (Ethocel, DuPont Company); (14) poly(vinyl pyrrolidone) (GAF Corporation); (15) poly(ethylene imine) epichlorohydrin (Scientific Polymer Products); (16) poly(2-acrylamido-2-methyl propane sulfonic acid) (Scientific Polymer Products); (17) poly(ethylene oxide) (Poly Ox W3000-3000, Union Carbide); (18) cellulose sulfate (Scientific Polymer Products); (19) monomeric monomeric epichlorohydrin (Mucal WT, Mucal 80-1, Mucal 82-2, Mucal 4-12, Mucal 8, Mucal 100, Mucal 500, Mucal Incorporated); (20) hydroxy butyromethyl cellulose (HBM, Dow Chemical Company); (21) vinylpyridine-maleic acid copolymer (Mucal 5-55, GAF Corporation); (22) poly(vinylidene) quaternized (Scientific Polymer Products); (23) hydroxyethylmethoxy cellulose (HEM, British Celanese Ltd, Tylose 100, Wisk, Keltan 2.5); (24) calcium hydroxyethyl cellulose (Polymor 40-125, Poly custom 10, Amerchol; calcium Cellulose, Union Carbide) and mixtures thereof, which mixtures include, for example, water effective amounts of from 1 to about 5 components in any combination of the present invention with the amount of components totaling 100 percent. Thus, for example, a first component can be present in an amount of from about 5 to about 95 weight percent and a second component can be present in an amount of from about 5 to about 5 weight percent.

The ink coating surfaces can contain coating compounds in various thicknesses as indicated herein depending, for example, upon the coating selected and the components utilized; however, generally the total thickness of the treatment layer is from about 0.1 μ m to about 25 μ m and preferably from about 0.5 μ m to 10 μ m. The coating of, for example, coating agent in binder can be applied to paper by a number of known techniques including size press treatment, dip coating, reverse roll coating, extrusion coating, and the like. The surface treatment of the paper can, for example, be accomplished on a KFF size press by size coating and by solvent evaporation on a Feustel Coater. The KFF size press is a hot size press that simulates a commercial size press. This size press is normally about 60 cm wide and is a continuous size press wherein a continuous web is selected. On the KFF size press is an agitator, the sheet of paper is fed by one end to the center mechanism plate. The speed of the web and the roll pressure are set, and the sizing solution is moved into the solution tank. A 4 slot stainless steel beaker, for example, is situated underneath for catching the solution overflow. The sizing solution is cyclized into

through the system (without moving the paper sheet) to wet the surface of the rolls and then returned to the feed tank where it is cyclized the second time. While the rolls are being "washed", the sheet is fed through the sizing rolls by pressing the center mechanism plate down. The sized paper is then removed from the center mechanism plate and is placed on a 30 by 100 cm sheet of 750 μ m thick Teflon for support and is dried in the Lymanic Formar drying oven and is roll under tension to provide storage. The drying temperature is approximately 100°C. This method of sizing coats both sides of the paper simultaneously.

In dip coating, a web of the material to be coated is transported below the surface of the coating of, for example, coating agent in binder material by a single roll in such a manner that the exposed side is saturated, followed by the removal of any excess coating by the squeeze rolls and dried at 100°C in an oven dryer.

The method of surface coating requiring a web is made in a continuous sheet of paper with the sizing material applied first to one side and then to the second side of the paper selected. With a known slot coating process, there is selected a flat die with the die lips at least parallel to the web of paper to be coated, resting in a continuous flow of the solution evenly distributed across the sheet, and thereafter dried in an oven dryer at 100°C.

In one specific process embodiment, the support of the present invention can be prepared by providing a primer, internally acidic sized, substrate such as Hoesl paper (30 lb form) in a thickness of from about 100 to about 125 μ m and applying to both sides of the paper by the known dip coating technique on a Feustel Coater, a thickness of 0.1 to 5 μ m, a coating agent such as Conton A7-172, which agent is present in a concentration of 2 percent by weight in water. Thereafter, the paper with the coating is air dried at 100°C and the resulting paper can be utilized in an ink jet printer, and the like as indicated herein.

In another specific process embodiment, the support of the present invention can be prepared by providing a substrate such as Hoesl 4024 (internally acidic sized but without any surface sizing) obtained in roll form in a thickness of about 100 μ m and applying by coating extrusion to one side a ternary blend of poly(ethylene oxide)-p-poly (dimethyl siloxane)-p-poly(ethylene oxide), 2 percent by weight, poly(vinylidene) quaternized, 1 percent by weight, hydroxypropylmethoxy cellulose, 2 percent by weight, which blend was present in a concentration of 4 percent by weight in water. Thereafter, the coating can be oven dried at 100°C and the paper can be utilized in a 4020 color ink jet printer to obtain images with optical density values of 1.65 (black), 1.72 (magenta), 0.82 (cyan), 0.75 (yellow) with edge registration values of 0.30 (between black and yellow), 0.50 (between cyan and yellow), and 0.45 (between magenta and yellow). Other

percentage of its original reflectance.

The porosity values tested herein were measured with a Porofirst First-Surf porositymeter which scans the volume of substance flowing through a sheet of paper. The edge roughness values tested in the present application were measured using an Olympus microscope equipped with a camera capable of enlarging the recorded ink jet images. The edge roughness value is the distance in millimeters for the inkjet line based on a checkerboard pattern.

The optical density measurements and the print through values tested herein were obtained on a Pacific Spectrograph Color System. The system consists of two major components, an optical sensor and a data terminal. The optical sensor employs a 152 nm light emitting diode to provide diffuse illumination and a 2 degree viewing. The sensor can be used to measure both transmission and reflectance samples. When reflectance samples are measured, a specular component may be included. A high resolution, full dispersion, grating monochromator was used to scan the wavelength from 380 to 720 nanometers (nm). The data terminal features a 385 nm CRT display, numerical keyboard for selection of operating parameters, and the entry of reflective values; and an alphanumeric keyboard for entry of product standard information. The print through value is characterized by the printing density in log base 10 reflectance of a single sheet of unprinted paper against a black background reflectance of the back side of a thick printed area against a black background) measured at a wavelength of 550 nanometers.

The following examples are being supplied to further define specific embodiments of the present invention. It being noted that these examples are illustrative in nature and not limit the scope of the present invention. Parts and percentages are by weight unless otherwise indicated.

EXAMPLE 1

There were prepared 20 (20% x 270 mm) sheets, 152 µm in thickness, (basis) of a laboratory stock paper with a tensile index of 2400 and a porosity of 120 millimetre in the Dynamic Former lab paper machine (manufactured by Allen and Essex), using a fibrous fiber pulp weighing 400 grams comprised of 70 percent by weight Bleached Kraft and 30 percent by weight L. Tropic dry bleached sulfonated Kraft board in the colley board by 27 millimetre. Trip material was added to a stainless steel storage tank and the percent solids were adjusted to 1.5 percent over dry with stabilizing water. The pH of the mixture was adjusted to 5.3. During the paper making process, the following operating conditions were used: wire speed - 935 meters/minute, jet speed - 105 meters/minute, jet to wire ratio - 1.5, stock flow - 1.5 liters/minute, stock

pressure - 2.7 bars, number of passes - 105, sheet basis weight - 75.0 grams/square meter, forming wire screen type - 77 x 55 mesh pleated wire screen from Johnson Wire Company, nozzle type - Model 2504-53, and nozzle settings - angle downward - spreading 5.0 centimeters.

The Dynamic Former was loaded with the selected forming wire screen and the main drive motor was turned on. When the forming wire reached the required speed, water was added to the former drum to allow the water web to become level with the rotating bars. The 400 gram prep feed (sheet) was then plucked from the holding tank at the spray nozzle, and the spray nozzle drive was started to evenly spray the finish on the making wire screen. When sufficient finish had been sprayed to form a sheet of paper, the nozzle drive motor and the pump motor were deactivated while the main drive continued to run. The excess water was then slowly removed by movement of a scraper which covered the water web in draw, leaving a thin pad of pulp fiber furnish evenly distributed on the pleated wire screen. The main drive motor was then deactivated and the endless belt of fiber was partially cut and lifted out of the former drum while the web was still on the pleated wire screen. The wet paper sheet (at approximately 20 percent solids) was then placed on a wool felt blanket and the pleated wire screen was removed. A sheet of 750 µm thick Teflon was placed on top of the wet paper sheet and the sandwich was then pressed through the Dynamic Former press section to increase the solid content to 45 percent level. This was accomplished by passing the sandwich pad between the press rolls under a nip pressure of 4.0 bar and twice at a nip pressure of 6.0 bar. The sheet of paper along with the Teflon bedding sheet was lifted off the felt web blanket and placed in the drying unit with Teflon in contact with the dryer surface. The dryer felt was then lowered over the paper sheet and was dropped in position to contain the sheet and prevent shrinkage during the drying process at 105°C.

Three laboratory paper sheets (flat 4) with 0.4 second internal aging, 1000 millimetre aging, were fed individually into a Xerox Corporation 40070 color ink jet printer having incorporated therein four separate developers: cyan comprised of water, 82 percent by weight, ethylene glycol, 5 percent by weight, and a magenta, cyan, yellow and black mixture, respectively, 2 percent by weight, and there was selected inkjet with average optical densities of 1.04 (cyan), 1.08 (magenta), 0.85 (cyan) and 0.81 (yellow) with average intercolorated (edge roughness) values of 0.25 millimetre (between black and yellow), 0.20 millimetre (between cyan and yellow), 0.15 millimetre (between magenta and yellow) and 0.55 millimetre (between magenta and cyan). The print through value of the black color was calculated at 0.251.

A 102 µm thick Xerox 4024 base paper with 102

surface aging but on internal bleaching aging values of 50 seconds printed under similar conditions with a Xerox 4020TM printer had a print through value of black (0.026) for the optical density of images 1.07 (black), 1.64 (magenta), 0.55 (cyan) and 0.84 (yellow). The dynamic bleed values, however, were higher at 2.6 milliseconds (between black and yellow), 0.55 milliseconds (between cyan and yellow), 0.40 milliseconds (between magenta and yellow), and 0.55 milliseconds (between magenta and cyan). This Xerox 4020TM paper was then treated on a Fauser converter with a 2 percent aqueous solution of a diblock copolymer (50 milligrams (mg) per sheet, 0.5 percent by weight of paper) consisting of *polydimethylsiloxane*-*l*-*poly(methyl siloxane ethylene oxide)* block copolymer (PS-075) and dried in the dryer oven at 100°C. The bleed-through aging value of 50 seconds (before treatment) decreased to 0.4 second (after treatment) indicating that the paper was treated. The resulting 13.5 gms sheet paper was then fed by a Xerox 4020TM color ink jet printer and images were obtained with optical density values of 1.0 (black), 0.67 (magenta), 0.55 (cyan) and 0.74 (yellow). The drying time for images printed on the aforementioned treated paper was less than 2 seconds as evidenced by the absence of ink offsetting or image smearing on the platen pinch roll. The print through value for black ink was calculated at 0.136, an increase from 0.026, but lower than 0.264 as was the situation for the lab prepared GSA paper with 0.4 second internal aging and no surface aging. The internal bleed values for the above prepared treated pieces of the present invention were 0.36 (between black and yellow), 0.50 (between cyan and yellow), 0.44 (between magenta and yellow) and 0.45 (between magenta and cyan) which are similar to those obtained with internal laboratory prepared 20 paper stock GSA with 0.4 second internal aging, but no surface aging. When replacing PS-075 with a mixture of PS-075 (2.0 percent by weight), *poly(trimethylol quaternized)* (1.0 percent by weight), *hydroxypropylmethyl cellulose* (2.0 percent by weight) in water as the drying solution on the roller, the print through values decreased to 0.106 without affecting the optical density and edge appearance of images.

EXAMPLE 2

There were prepared 30 sheets each (24 X 270 mm) of 16 mils of plain paper with surface pH ranging from 8.5 to 1.0 containing different levels of internal aging (acidic from 0.2 available from Monsanto) but with no surface aging as the Dynamic Former using blends of Sargul W dry bleached iontreated kraft, 70 percent by weight, and La Tigue dry bleached softwood kraft, 30 percent by weight, in combination with titanium dioxide, filler clay, alum and internal aging. Papers were prepared from the following

formulation by the process described in Example 1:
 (Set-1) 292 grams of pulp blend, 8 grams of titanium dioxide (bleaching aging value 0.4 second, porosity 220 millimetre); (Set-2) 302 grams of pulp blend, 8 grams of titanium dioxide, 1 gram of sizing, 1 gram of alum and 0.2 gram of retention aid (bleaching aging value of 26 seconds, porosity 230 millimetre); (Set-3) 302 grams of pulp blend, 8 grams of titanium dioxide, 2 grams of sizing, 2 grams of alum and 0.2 gram of retention aid (bleaching aging value 355 seconds, porosity 275 millimetre); (Set-4) 293 grams of pulp blend, 9 grams of titanium dioxide, 4 grams of sizing, 4 grams of alum and 0.3 gram of retention aid (bleaching aging value 455 seconds, porosity 280 millimetre); (Set-5) 372 grams of pulp blend, 8 grams of titanium dioxide, 20 grams of clay (bleaching aging value 0.4 second, porosity 220 millimetre); (Set-6) 372 grams of pulp blend, 8 grams of titanium dioxide, 20 grams of clay, 2 grams of sizing, 2 grams of alum and 0.3 gram of retention aid (bleaching aging value 90 seconds, porosity 240 millimetre); (Set-7) 372 grams of pulp blend, 8 grams of titanium dioxide, 20 grams of clay, 4 grams of sizing, 4 grams of alum and 0.2 gram of retention aid (bleaching aging value of 550 seconds, porosity 260 millimetre); (Set-8) 332 grams of pulp blend, 8 grams of titanium dioxide and 50 grams of clay (bleaching aging value 0.4 second, porosity 180 millimetre); (Set-9) 332 grams of pulp blend, 8 grams of titanium dioxide, 60 grams of clay, 2 grams of sizing, 2 grams of alum, 0.3 gram of retention aid (bleaching aging value 40 seconds, porosity 220 millimetre); and (Set-10) 332 grams of pulp blend, 8 grams of titanium dioxide, 50 grams of clay, 4 grams of sizing, 4 grams of alum, 0.3 gram of retention aid (bleaching aging value 125 seconds, porosity 230 millimetre). Seven sets of these papers with no surface aging but having internal aging values of 20, Set-1; 40, Set-2; 60, Set-3; 135, Set-4; 355, Set-5; 475, Set-6; 550, Set-7, seconds were printed in a Xerox 4020TM color ink jet printer. The internal bleed values ranged between 1.0 to 3.0 (between black and yellow); 0.75 to 2.5 (between cyan and yellow); 0.5 to 1.2 (between magenta and yellow); and 0.7 to 2.7 (between magenta and cyan). These seven papers were treated in the lab by the coating room with aqueous solutions (concentrations ranging between 0.25 gram/100 milliliters to 4.0 gram/100 milliliters, respectively) of the coating agent *polydimethylsiloxane*-*l*-*poly(methylsiloxane ethylene oxide)* block copolymer (PS-075) 75-77, a copolymer, and oven dried at 100°C. To achieve an internal aging value for all seven sets of papers to a level of 0.4 second, the porosity concentration of Akcel 727-70 by weight of the paper was approximately 0.5, 1.3, 2.0, 3.6, 4.0, 5.0 and 6.0, the lowest being having aging values of 26 seconds and the highest being for the aging value of 550 seconds. The average optical density values of images with Set-1

6. Set-E papers which did not contain any clay were 1.06 (black), 1.25 (magenta), 1.63 (cyan) and 0.83 (yellow). The average optical density values for Set-C, Set-H papers (8 percent clay) and Set-I, Set-K (15 percent clay) were 1.05 (black), 1.0 (magenta), 0.95 (cyan), 0.75 (yellow) and 0.65 (black), 0.85 (magenta), 0.86 (cyan), and 0.72 (yellow), respectively. The values of optical densities for treated papers at internal sizing of 0.4 second are similar to those obtained with their respective untreated blank counterparts. Set-B, Set-F, Set-I having Hercules internal sizing value of 0.4 second. However, the edge roughness (intercolor bleed) values of all seven treated papers at Hercules sizing value of 0.4 second were reduced to 0.37 (between black and yellow), 0.49 (between cyan and yellow), 0.17 (between magenta and yellow), and 0.50 (between magenta and cyan). The print through values of images for untreated papers of Set-C and treated papers for Set-C, Set-I and Set-E containing no filler were calculated at 0.275, 0.205, 0.180 and 0.135, respectively. The print through values of images for untreated papers of Set-F and treated papers of Set-C and Set-I containing 5 percent clay were calculated at 0.275, 0.150 and 0.130. The print through values of images for untreated papers from Set-I and treated papers from Set-I and Set-K containing 15 percent by weight of filler clay were calculated at 0.265, 0.180 and 0.125, respectively. These results suggest that the treated but non-sized edge compensates as well as filler clay help to improve print through. The porosity values of the seven sets of treated papers increased only by about 20 percent suggesting that the glass reinforced dissolving of papers is the predominant factor in improving the edge roughness of jet papers.

EXAMPLE 10

There were prepared 20 sheets each (215 X 275 mm) of dimensions of filed papers (surface 9.8) containing different levels of calcium silicate (50, 127, 275, 500, but no internal sizing and no surface sizing, on the Hercules Fortrel webbing blends of Regal W dry finished basecoat lot), 70 percent by weight, and the Tupper by Blackford hollowood lot, 80 percent by weight. Papers were prepared from the following formulas by the processes described in Example 1: Set-L, 500 grams of pulp, 40 grams of calcium silicate (paper thickness 115 µm, porosity 325 milliliters, Hercules internal sizing 0.3 second); Set-M, 500 grams of pulp, 80 grams of calcium silicate (paper thickness 127 µm, porosity 325 milliliters, Hercules internal sizing 0.3 second); and Set-N, 280 grams of pulp, 120 grams of calcium silicate (paper thickness 142 µm, porosity 330 milliliters, Hercules internal sizing 0.3 second). These three sets of papers were coated with Xerox 4020TM color ink jet ink and images were obtained. The edge roughness values of all

three sets were recorded at 0.11 (between black and yellow), 0.22 (between cyan and yellow), 0.12 (between magenta and yellow), and 0.38 (between magenta and cyan). The average optical density of all three sets, Set-L, Set-M, Set-N were measured at 0.92, 1.00, 0.92 (black); 0.83, 0.65, 0.67 (magenta); 0.94, 0.83, 0.85 (cyan); and 0.77, 0.74, 0.67 (yellow), respectively. The print through values for Set-L, Set-M and Set-N were recorded at 0.175, 0.130, 0.085, respectively. These three sets of papers were treated with Carbox A7-172 at the present invention by reflecting a dip coating process using 1 percent aqueous solutions and dried at 100°C in an oven. These treated papers were then fed into a Xerox 4020TM color ink jet paper and images were obtained with the following characteristics: print through values for Set-L (paper thickness 122.7 µm, porosity 350 milliliters), Set-M (paper thickness 123.6 µm, porosity 325 milliliters); and Set-N (paper thickness 143.1 µm, porosity 350 milliliters) were lowered to 0.135, 0.082 and 0.084, respectively; no change in the edge roughness values; optical densities of images were increased at 1.51, 1.02, 1.03 (cyan); 1.67, 1.02, 0.97 (magenta); 1.06, 0.97, 1.00 (cyan); and 0.81, 0.77, 0.78 (yellow), a slight increase in most cases. These results indicate that this dissolving agent improves print through as well as the optical density of the images. Furthermore, a comparison of the print through values for untreated lower cost jet filed papers from Set-F and Set-I (0.265 and 0.250) with higher cost jet coated black papers of Set-L (0.175) indicates that the latter material was superior in improving print through in this instance.

EXAMPLE 11

Commercially available internally and surface sized glass papers 90 cm in thickness and with an average Hercules sizing value of 1,100 seconds were based in the laboratory using a dip coating process with aqueous solutions and methanol solutions of the following commercial dissolving agents and used at 100°C in an oven. The Hercules sizing values for the treated papers were measured in seconds and are presented in parentheses following the identity of the material, for 1 percent by weight, 99 percent of water: aqueous solutions of Tetraol 502 (430.5), Tetraol 5076 (414.5), Tetraol CT (355), Alkacore PGP 35-6 (250.5), Tetraol 2508 (161), Fluoroc F-77 (101.5), Iconosol 1-10 (90.5), Alkacore 201 D (74.5), Tetraol 604 (22), Tetraol 5074 (26), P-072 (10.5), P-075 (10.5), Alkacore C-0-255 (5), Alkacore L-07-05 (5), Alkacore U-14 (4.5), Alkacore C-0-12 (4), Alkacore E-05 (2.5), Alkacore NEF-72-70 (4), P-070 (4), P-075 (3), P-073 (3), Dimer A7-172 (3), Alkacore L-07-05 (1.5), and Alkacore L-07-05 (0.5); for 1 percent by weight methanol solution, poly(1,4-oxydiphenyl glycol) (29), Alkacore D-07 (15), Alkacore C-0-

10 (7), Alkamat 7 (3.5), Argoline-275 (5), Alkamat-5 (8), Alkamat 80-96A (1.2), Alkamat MP-4 (2.5), Placenta 25R2 (5.5), Talcum 502 (2), Alkamat 80000 (2.5), Alkamat 075-8 (2), Alkamat 5A-2 (1.5), Alkamat L454-2 (1), tri(isopropylammonium glycol dimethacrylate) (1), Alkamat 7-2, (1) polypropylene glycol (1), Isomax 7-2 (1), Alkamat CDE (1), Talcum 180R1 (1), Alkamat 125-5 (1), Placenta L101 (1), Alkamat C-2 (1), Alkamat 550 (1), Alkamat STC (1), Alkamat C4 (0.5), Alkamat 55-0-75 (0.5), Alkamat AM-1 (0.5), Alkamat 055-55-55 (0.5), and Alkamat STC (0.5); for water alone no desizing agent (1.000); and for methanol alone no desizing agent (1.000).

EXAMPLE V

The following commercially available fibrous and surface sized papers with a wide range of fibrous sizing (expressed in seconds) and porosity (expressed in millinits) were selected for treatment with ASA desizing agent by repeating the procedure of Example IV. The fibrous ASA sized papers are: copy paper-1 (1.5 seconds, 540 millinits), copy paper-2 (2.2 seconds, 540 millinits), Sanyo-L (22.2 seconds, 500 millinits), and A42 sized copy paper-3 (10.2) seconds, 500 millinits; for each sized Nixor papers (1.250 seconds, 370 millinits), Great Lakes offset paper (271.3 seconds, 420 millinits), recycled Densarthen paper (22.4 seconds, 430 millinits), Automaton offset paper (55.0 seconds, 1,260 millinits), Eddy Rapid tone paper (22.5 seconds, 70 millinits), copy paper from Nixor (150 seconds, 600 millinits), Chromon (250 seconds, 540 millinits), Nixor 4024™ (no surface sizing) (65 seconds, 510 millinits), Wiggins Tapp (57.2 seconds, 400 millinits), Xytronic (100 seconds, 500 millinits), Carstar (20 seconds, 500 millinits), Modr (37.7 seconds, 420 millinits), Vedolite (240.4 seconds, 540 millinits), jet jet papers, Jones River Ultra (300 seconds, 130 millinits), Hewlett Packard Print-Jet (124 seconds, 350 millinits), and Jijo (207 seconds, 120 millinits) were treated with 1 percent aqueous solution of Nixor AT-177 by a dip coating process and dried at 100°C in an oven. The fibrous sizing and porosity values of the treated papers were recorded as follows: Ultra paper (1.0 seconds, 410 millinits), Hewlett-Packard (1.5 seconds, 400 millinits), Densarthen (0.5 second, 500 millinits), Nixor (0.5 second, 540 millinits), Chromon (1.2 seconds, 500 millinits), Automaton (0.7 second, 1,200 millinits), Eddy Rapid tone paper (0.5 second, 80 millinits), Nixor 4024™ (no surface sizing) (0.5 second, 540 millinits), Wiggins Tapp (0.8 second, 490 millinits), Xytronic (0.5 second, 500 millinits), Carstar (0.3 seconds, 710 millinits), copy paper-1 (0.5 second, 500 millinits), copy paper-2 (0.5 second, 540 mil-

nits), jet paper-3 (0.4 second, 500 millinits), Jijo (0.5 second, 500 millinits), Vedolite (1.4 seconds, 550 millinits), Sanyo-L (1.1 second, 540 millinits), Jones River Ultra (0.2 seconds, 200 millinits), Hewlett Packard Print-Jet (0.2 second, 500 millinits), and Jijo (1.3 seconds, 120 millinits). These results indicate that the desizing agents of the present invention can desize a variety of papers containing alkaline size and sizing (acrylamide and tander size) without any loss of strength without causing excessive changes in their porosity values which can be of importance for certain printing applications such as liquid paper printing with solvent or oil based inks.

EXAMPLE VI

Ten sheets were prepared by sterily desizing the procedure of Example V 100 (216 X 270 mm) sheets (Set-C) of treated papers by reflecting a size press treatment of a Xerox 4024™ base paper (which had no surface sizing) with a mixture of calcium stearate (10 percent by weight), poly(methyl methacrylate) (10 percent by weight), poly(styrene-butadiene) (10 percent by weight), poly(methyl methacrylate) (10 percent by weight), which mixture was dissolved in a concentration of 2 percent by weight in water. These sheets were dried at 100°C in the drying unit of the Dynamic Former. Ten of these sheets were then fed into a Xerox 4024™ color jet printer and images were obtained. The average optical density of 100 images was 1.01 (black); 1.02 (magenta), 0.97 (cyan) and 0.90 (yellow). The average edge roughness values of 100 papers were calculated as 0.25 (between black and yellow), 0.40 (between cyan and yellow), 0.15 (between magenta and yellow), and 0.50 (between magenta and cyan) with a print-through value of 0.10. These 100 images could not be scratched or lifted off with a 500 mesh tape 60 seconds subsequent to their preparation.

EXAMPLE VII

Ten sheets of treated papers from Set-C obtained from Example VI were fed into a Xerox Corporation 1000™ color xerographic apparatus and images were obtained with average optical density values of 1.02 (black), 1.20 (magenta), 1.70 (cyan) and 0.90 (yellow). The print-through value of black was calculated as 0.050. These images could not be scratched or lifted off with a 500 mesh tape 90 seconds subsequent to their preparation.

EXAMPLE VIII

Ten sheets of treated papers from Set-C obtained from Example VI were fed through a Xerox Corporation 1075™ imaging apparatus and yielded images

with an average optical density of 1.3 (black) with a print through value of 0.066. These images could not be handled prior to about 60 seconds subsequent to their preparation.

EXAMPLE IX

Ten sheets of treated paper from Set C obtained from Example VI were fed into a dot matrix printer, available from Roland Inc. as Roland PR-1012. The average optical density of the resulting images was 1.16 (black) with a print-through value of 0.160. These images could not be handled prior to about 60 seconds subsequent to their preparation.

EXAMPLE X

Ten sheets of treated paper from Set D obtained from Example VI were fed into a Xerox Corporation Monomatrix[®] (approximate) equipped with a single ribbon unit. Images of optical density 1.1 (black) were obtained. These images could not be handled prior to about 60 seconds subsequent to their preparation.

EXAMPLE XI

There were prepared ten sheets of treated paper each to a thickness of 217 μ m by effecting a dry casting of 87.5 μ m thick lacquer and acetone steel liquid toner papers (Fluorene mixing value 12.5 seconds, viscosity 70 millipoise) in a solution of hydroxyethyl cellulose (1 percent by weight) and Alkathol-0 (2 percent by weight), which mixtures are present in a concentration of 2 percent by weight in methanol. These sheets were then dried at 100°C. in an oven. Five of these ten sheets were fed into a Xerox Corporation 4020[®] and images were obtained with average optical density values of 1.05 (black), 1.0 (magenta), 0.66 (cyan) and 0.75 (yellow). The edge raggedness values for these images were 0.40 (between black and yellow), 0.60 (between cyan and yellow), 0.25 (between magenta and yellow) and 0.60 (between magenta and cyan). The print-through value for black was calculated as 0.166. In comparison, an untreated liquid toner paper when fed into Xerox Corporation 4020[®] ink jet printer had images with slightly higher optical density values of 1.15 (black), 1.10 (magenta), 1.10 (cyan) and 0.66 (yellow) but the edge raggedness of these images was much higher at 2.5 (between black and yellow), 2.0 (between cyan and yellow), 1.0 (between magenta and yellow), and 1.4 (between magenta and cyan) with a print-through value for black at 0.166. The five remaining sheets were fed into an Okidata-20 (USA Company) thermal transfer printer. The resulting images had average optical density values of 1.24 (black), 0.84 (magenta) and 1.10 (cyan). In comparison, an untreated liquid

toner paper when printed with Okidata-20 yielded images with slightly higher optical density values of 1.28 (black), 0.99 (magenta) and 1.27 (cyan).

EXAMPLE XII

There were prepared 20 sheets each (216 \times 275 mm) of three sets (Set-F, Set-G, Set-H) of lined papers with a surface pH of 7.0 containing identical levels of (CH₂CH₂CH₂CH₂) various fillers, clay, clay, fluorine fillers but different degrees of internal sizing (acetyl-licar size available from Monsanto Company) and no surface sizing in the Dymonic-Flexon mixing blends of Sengul W dry bleached hardwood kraft, 70 percent by weight, and Lx Trique dry bleached softwood kraft, 30 percent by weight. Papers were prepared from the following formulas using the procedure described in Example I: Set-F, Set-G, and Set-H all contain 280 grams of pulp, 60 grams of calcium silicate, 40 grams of clay, 20 grams of titanium dioxide, 20 grams of silica, and 0.5 gram of retentive aid, but differ in the amount of sizing in each case, for example, Set-F contains 12 grams of sizing (fluorene internal sizing 204 seconds, paper thickness 110 μ m, density 245 millipoise), Set-G contains 18 grams of sizing (fluorene internal sizing value of 458 seconds, paper thickness 127 μ m, density 205 millipoise), and Set-H contains 32 grams of sizing (fluorene internal sizing 757 seconds, paper thickness 104.5 μ m, density 205 millipoise). Five papers from each set were individually fed into a Xerox Corporation 4020[®] ink jet printer and images were obtained with an average optical density value of 1.1 (black), 1.0 (magenta), 0.66 (cyan), and 0.75 (yellow) with edge raggedness values of 0.40 (between black and yellow), 0.60 (between cyan and yellow), 0.25 (between magenta and yellow) and 0.60 (between magenta and cyan). Five papers from each set were treated with a 1 percent by weight solution of Alkathol LAGP15 and five other papers from each set were treated with a 50/50 blend of Alkathol LAGP15 and hydroxyethyl cellulose 200 Lx, which blend was present in a concentration of 2 percent by weight in water. These papers were dried at 100°C. in an oven. The fluorene internal sizing value of all treated papers was about 0.5 second. These papers were fed into a Xerox Corporation 4020[®] ink jet printer and images were obtained with edge raggedness values of 0.12 (between black and yellow), 0.25 (between cyan and yellow), 0.15 (between magenta and yellow) and 0.20 (between magenta and cyan). The average optical density values of the papers treated with Alkathol LAGP15 alone were 0.90 (black), 0.85 (magenta), 0.75 (cyan), and 0.65 (yellow). Papers treated with blends of Alkathol LAGP15 and hydroxyethyl cellulose 200 Lx had optical density values of 1.05 (black), 0.87 (magenta), 1.00 (cyan) and 0.78 (yellow). The print-through values of treated papers from Set-F (black

Hercules internal sizing value 204 seconds), Set-2 (initial Hercules internal sizing value 460 seconds), and Set-R (initial Hercules sizing value 767 seconds) were treated at 0.172, 0.040, and 0.053 for treatment with Akzo/LACP 15 alone and at 0.102, 0.050, and 0.067 for treatment with a blend of Akzo/LACP 15 and hydroxyethyl cellulose 200 LR. These results suggest that the initial high sizing composition helps improve wet strength even though the fibers are treated after treatment. The porosity values after treatment of base webs of papers with Akzo/LACP 15 alone increase by about 20 to 30 percent, but remained unchanged when treated with blends of Akzo/LACP 15 and hydroxyethyl cellulose 200 LR.

EXAMPLE XIV

There were prepared 40 sheets (218 X 275 mm) each of two sets (Set-2, Set-1) of test papers with surface pH of 8.0 containing identical levels of (1) 25% calcium silicate, (2) 10% titanium dioxide, but different degrees of internal sizing (calculated using Herman 76 available from Hercules Chemical Company) and no surface sizing on the Dynamic Fenton using blends of Soergel W dry bleached hardwood kraft, 70 percent by weight, and 10 percent dry bleached softwood kraft, 30 percent by weight. Papers were prepared from the following formulae using the procedure described in Example 1; the Set-2 and Set-1 both contain 200 grams of pulp, 100 grams of sodium chloride, 20 grams of titanium dioxide, 0.3 gram of red iron, and not differ in the amount of sizing in each instance, but differ in the amount of sizing (Hercules internal sizing value of 2,660 seconds, paper thickness of 130 µm, porosity of 470 milliliters), and Set-1 contains 30 grams of sizing (Hercules internal sizing value of 4,660 seconds, paper thickness of 130 µm, porosity of 375 milliliters). Two papers from each set were individually fed into Xerox Corporation 4020™ jet printer and magenta were colored with an average value of 0.75 (black), 0.70 (magenta), 0.90 (cyan), and 0.80 (yellow) with edge raggedness values of 0.40 (between black and yellow), 0.35 (between cyan and yellow), 0.20 (between magenta and yellow), and 0.75 (between magenta and cyan). Two papers from each set were treated with the following dosing agents of this invention and the Hercules sizing values for treated papers were measured in seconds and are presented in brackets following the identity of the dosing agent. Treatments with 5 percent by weight acetone in methanol (1) (1) polyoxyethylene glycol Akzo/LACP 4000 (0.3 seconds); (2) 10% dimethyl ether copolyester of propylene carbon and ethylene oxide, Talcote 100 R, (1.2 seconds); and (3) sorbitol monododecanoate, Akzo/LACP 4000 (0.3 seconds); (4) glyceryl monododecanoate, Akzo/LACP 4000 (0.3 seconds); (5) poly(ethylene glycol diacrylate), Akzo/LACP 4000 (0.3

seconds); (6) dimethyl ether, 100 R (1.5 seconds); (7) sodium diethyl sulfonate, Akzo/LACP 4000 (0.3 seconds); (8) calcium diethyl dodecanoate, Akzo/LACP 4000 (0.3 seconds); (9) dimethyl ether, Akzo/LACP 4000 (0.3 seconds); (10) and ethoxyethylene, Akzo/LACP 4000 (0.3 seconds); (11) ethoxyethylene, Akzo/LACP 4000 (0.3 seconds); (12) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (13) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (14) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (15) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (16) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (17) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (18) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (19) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (20) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (21) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (22) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (23) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (24) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (25) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (26) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (27) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (28) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (29) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (30) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (31) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (32) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (33) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (34) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (35) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (36) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (37) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (38) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (39) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds); (40) linear alcohol ether, Akzo/LACP 4000 (0.3 seconds). These papers had deposited on them approximately 200 milligrams of the dosing agent (7.5 percent by weight of the paper). These papers were fed individually into a Xerox Corporation 4020™ color jet printer and magenta was additional which filled in less than two seconds and had an average color density value of 0.75 (black), 0.70 (magenta), 0.90 (cyan), and 0.80 (yellow) for the methanol soluble dosing agents and 0.27 (black), 0.60 (magenta), 0.85 (cyan), and 0.80 (yellow) for the water soluble dosing agents. The edge raggedness values of all dosing agents were in the vicinity of 0.12 (between black and yellow), 0.20 (between cyan and yellow), 0.10 (between magenta and yellow), and 0.40 (between magenta and cyan). The pore through values of Set-2 treated samples with initial Hercules sizing value of 2,660 seconds were slightly higher at 0.055 compared to Set-1 (0.050 seconds) treated samples with pore through values of 0.045. These results indicate that the dosing agents of the present invention do not affect the wet strength of the paper and that the edge raggedness of the paper is not affected by the dosing agent.

EXAMPLE XV

There were prepared 5 treated papers of a thickness of 124 µm and porosity 200 milliliters from Set-R of Example 1 by affecting a dry coating of these sheets with a coating solution of Akzo/LACP 4000 which coating was present in a concentration of 2 percent by weight in methanol. Subsequent to oven drying at 100°C and monitoring the weight gain and subsequent to coating, these sheets had gained about 100 milligrams, 50 milligrams on each side, 2.5

percent by weight of the paper) 0.8 mm in thickness, of Alkathene-G (sheet color). These papers were color-treated in a 3 Rod Lin ColorJet Black (Pharos Chroma-Jet) in a capacity of 100 minutes and a thickness of 50 µm. Two of these papers were fed into an Omron 20 (Old Chroma) thermal transfer printer. The resulting images had optical density values of 1.40 (black), 1.12 (magenta) and 1.5 (cyan with a tint through value of 0.070). Two other papers were fed into a Xerox 4020TM color ink jet printer and there were obtained images with optical density values of 0.88 (black), 0.91 (magenta) 0.86 (cyan), and 0.76 (yellow) with a tint through value of 0.150. The step wedge values of these images were recorded at 0.15 (between black and yellow), 0.25 (between cyan and yellow), 0.15 (between magenta and yellow) and 0.40 (between magenta and cyan).

The above results indicate that alone and that papers when treated with the desizing materials and colorants to low porosity are useful for inkjet, and thermal transfer printing, and the like, where low porosity papers are required.

EXAMPLE XX

There was prepared five treated papers in a thickness of 124.5 µm, namely 260 milibrite from Scott of Example XI by affixing a dip coating of these sheets into a coating layer of Color AT-172, 10 percent by weight, hydroxyethyl cellulose 260 LR, 40 percent by weight, xanthan gum (primary impurity), Merck 0.20 percent by weight, and colloidal silica (Hydrol 244 x 1.517), 30 percent by weight, which blend was present in a concentration of 5 percent by weight in water. Subsequent to oven drying at 100°C and measuring the weight prior to and subsequent to coating, these sheets had present on each side 2.5 grams per meter square of the coating mixture. 5 µm thick on each side of the sheet. The porosity value for this coated paper was measured at the 1.5 seconds and porosity value of 25 minutes. These sheets were then fed individually into a Xerox Chromaliter 4020TM color ink jet printer and images were obtained with optical density values of 1.40 (black), 1.30 (magenta), 1.26 (cyan), 0.64, and (yellow) with edge registration values of 0.10 (between black and yellow), 0.30 (between cyan and yellow), 0.14 (between magenta and yellow), and 0.40 (between magenta and cyan), and tint through value of 0.050. The print through value for commercially available dye film coated paper of 80.5 µm thickness, Hercules film value of 207 seconds, porosity 120 milibrite, with optical density values of 1.45 (black), 1.52 (magenta), 1.50 (cyan), and 0.68 (yellow) when printed with a Xerox Chromaliter 4020TM inkjet printer, was 0.079.

Other modifications of the present invention will occur in those skilled in the art and are therefore

of the present application. These modifications, including equivalents thereof, are intended to be included within the scope of the present invention.

Claims

1. A paper comprising a supporting substrate treated with, or having thereon a coating of, one or more desizing agents selected from: (1) hydrophilic poly(dialkylsiloxanes); (2) poly(alkylene glycol); (3) polypropylene oxide; poly(ethylene oxide); copolymers; (4) fatty ester modified compounds of phosphoric acid, citric acid, glyceric acid, poly(hydroxy glycol), sulfosuccinic acid, acetic acid, alkyl amine; (5) acetoxyalkylene modified compounds of acetone esters, fatty amines, alkane oxides, urea oil, fatty acid, fatty alcohol; (6) quaternary alkylalkyl compounds; (7) fatty hydroxylates.
2. A paper in accordance with claim 1 wherein the desizing agent is admixed with, or dispersed in, a resin binder polymer.
3. A paper in accordance with claim 1 wherein the desizing agent is thereon in or combined with a hydrophilic film forming binder component.
4. A paper comprising a supporting substrate with a coating including a desizing agent and a hydrophilic polymer.
5. A paper in accordance with claim 4 wherein the hydrophilic polymer is a cellulose film forming binder component.
6. A paper in accordance with any one of claims 1 to 5 wherein the desizing agent is thereon in or admixed with a film forming binder with a film component.
7. A paper in accordance with claim 6 wherein the film component includes one or more of: clay, calcium silicate, calcium carbonate, hydrated silica, and colloidal inorganic.
8. A paper in accordance with claim 6 or claim 7 wherein the film component includes a pigment.
9. A paper in accordance with claim 8 wherein the pigment component includes one or more of: calcium silicate, titanium dioxide, and barium sulfate.
10. A paper in accordance with any one of claims 1 to 5 wherein the coating includes starch.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 20 0589

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Number of document with indication, where appropriate, of relevant passages	Relevant location	Classification of the document (IPC Class.)
1	<p>041650 ABSTRACTS OF JAPAN</p> <p>vol. 15, no. 242 (N-743) (3199) 12 September 1988.</p> <p>6-30-88 JIGYU (CA600) 12 SEP 1988.</p> <p>* non-patent document *</p>	2	<p>000129/88</p> <p>200105/88</p> <p>50005/88</p>
2	<p>041650 ABSTRACTS OF JAPAN</p> <p>* page 2, lines 19 - 22, column 6-11 *</p>	1	<p>000129/88</p> <p>200105/88</p> <p>50005/88</p>
<p>The printed search report has been drawn up by 20 sheets</p>			<p>000129/88</p> <p>200105/88</p> <p>50005/88</p>
<p>Date of search: 15 MAY 1991</p>		<p>Date of completion of the search: 15 MAY 1991</p>	
<p>The name: THE NAME</p>		<p>The name: THE NAME</p>	
<p>1. priority documents (if any) cited</p> <p>2. priority documents (if any) cited</p> <p>3. priority documents (if any) cited</p> <p>4. priority documents (if any) cited</p> <p>5. priority documents (if any) cited</p> <p>6. priority documents (if any) cited</p> <p>7. priority documents (if any) cited</p>		<p>8. priority documents (if any) cited</p> <p>9. priority documents (if any) cited</p> <p>10. priority documents (if any) cited</p> <p>11. priority documents (if any) cited</p> <p>12. priority documents (if any) cited</p> <p>13. priority documents (if any) cited</p> <p>14. priority documents (if any) cited</p> <p>15. priority documents (if any) cited</p> <p>16. priority documents (if any) cited</p> <p>17. priority documents (if any) cited</p> <p>18. priority documents (if any) cited</p> <p>19. priority documents (if any) cited</p> <p>20. priority documents (if any) cited</p>	